

PRISM Semi-annual Oceanographic Survey of Puget Sound: Overview and Water Mass Results

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In June 1998, University of Washington's PRISM project, in collaboration with Washington State Department of Ecology, initiated a comprehensive oceanographic survey of Puget Sound and the eastern Strait of Juan de Fuca. Since then, this survey has been repeated every June and December up to now, with an additional survey conducted in August 1999. The survey uses the University's R/V Thomas G. Thompson, with the State of Washington providing ship-time support. This is the first time in two decades in which a regular oceanographic survey of Puget Sound is conducted with a comprehensive coverage, high spatial resolution and modern analytical techniques. A great emphasis is placed on student participation, and student volunteers work side by side with scientists from the University and state and local governments. Data collected include CTD, oxygen, fluorescence, transmissivity and PAR from electronic sensors; oxygen, nutrients, chlorophyll, dissolved organic compounds and chlorofluorocarbons from bottle samples; and measurement of primary productivity from on-board incubation experiments. Data from these cruises are used for calibration of circulation models of Puget Sound. In this talk we present results of hydrographic measurements and discuss water masses in Puget Sound and their seasonal and interannual variability.

Mixing Levels in the Main Basin of Puget Sound

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Abstract

Knowledge of the levels and mechanisms of mixing is essential to understanding basic estuarine characteristics such as residence time, deep-water renewal processes, biological productivity, and tracer distribution. Typically, turbulence levels in Puget Sound have been inferred from hydrodynamical and tracer conservation models by matching model results to observations. In the late spring and early summer of 1988, with funding from the Washington State Sea Grant, we recorded the first direct measurements of turbulence levels in the main basin of Puget Sound. Microstructure data of temperature, conductivity and high-frequency velocity fluctuations were collected using the Advanced Microstructure Profiler (AMP). Absolute velocity data were collected using a RD Instruments 150 kHz narrowband Acoustic Doppler Current Profiler. Here we concentrate on profiles collected while the R/V MILLER was anchored at four different locations within the north main basin of Puget Sound. These time series ranged from 4 to 10 hours long with AMP drops completed from the surface to near-bottom about every 8 minutes. Three of the four time series were recorded over the smaller of the two semi-diurnal tidal ranges near the minimum of the

fortnightly tidal cycle. This suggests that for these three time series the tidally generated shear would be weaker than average and the shear generated from the subtidal circulation stronger. Turbulent kinetic energy dissipation rates, ϵ , and diapycnal diffusivities, K_ρ , show background values tend to be significantly elevated over those of the open ocean thermocline; $5 \times 10^{-8} \text{ Wkg}^{-1}$ and $5 \times 10^{-4} \text{ m}^2\text{s}^{-1}$ respectively. We observed higher values of ϵ and K_ρ ($3 \times 10^{-6} \text{ Wkg}^{-1}$ and $3 \times 10^{-3} \text{ m}^2\text{s}^{-1}$) in regions of increased velocity shear and supercritical Richardson numbers (<0.25) caused by mid-depth, warm intrusions. Density profiles show that the deep waters of the main basin have a comparable stratification to the main thermocline in the open ocean, supporting the formation of internal gravity waves. The breaking of these waves could also be a significant source of mixing in the main basin.